J. R. Capron, but there seems to be a factor yet unconsidered connected with sharpness of eyesight which is not dependent on the varying aperture of the pupil of the eye. The same amount of light exerts different degrees of stimulus on different individuals, and even in the same person the optic nerves are differently affected, according to his health or age. The pathologist is familiar with the exalted irritability induced by inflammation.

The observer of close double stars becomes in time painfully aware that through age his power of appreciating minute points of light is blunted, although his eye may be in a healthy condition, and quite equal to microscopic work under suitable illumination.

The flattening of the cornea, together with the slow reduction of the curves of the crystalline lens, is a common occurrence, and this change is said to commence at the age of forty-five.

Modification of form and the inability to vary the distance between the lens and the retina, due to defective power in the muscles of the iris, are the chief causes of short sight. On the other hand, the eye appears to have great capabilities of modifying itself to circumstances. It may degenerate by disuse, and even become obliterated, as may be seen in the blind aquatic beetles of dark caverns, the flea of the bat, and in many species of underground Aphides. Similarly it would seem that the eyes of the student who habitually pores over half-legible German or other type, or the eyes of the watchmaker or the engraver, who use lenses, will permanently accommodate themselves to the short foci required to view objects at short distances, and such modifications may be conceived to become hereditary.

The pupil of the eye perhaps has an aperture wide enough to admit the pencil of light from any telescope; yet it may be worth some consideration whether the sensitiveness of the eye may not for certain purposes be increased, under due precautions, by the use of some such drug as atropa belladonna. The iris thus might be made less contractile under the overpowering light of a planet, and perhaps allow a better observation of a minute satellite revolving close to its primary. It is a well-recognised fact that a faint star once seen may often afterwards be detected with comparative ease by other persons, if its position be truly shown.

Venus may be often seen in broad daylight, if the planet be pointed to by suitable marks.

Care of course would be taken that the use of belladonna shall not cause the observer to see too much. G. B. BUCKTON

THE controversy in NATURE on this subject has brought back to my thoughts a singular illustration of the power of trained eyesight which seems worth noting, though it does not touch the exact comparison between savage and civilised eyes which is the immediate subject of the letters which have appeared in your columns. I refer to the vastly greater capacity for determining visual direction supplied by the sense of symmetry than by actual discrimination between two slightly distant visible points. If you look at a circle, you can aim at its centre with far greater exactitude than you could aim at a point in the true centre of the figure. Every rifleman and every billiard-player exemplifies this. Suppose a billiard-ball placed a little less than five feet from a pocket, and played at as a half-ball stroke from an equal distance for a winning hazard. This is something like what has to be done from baulk in making a pair-of-breeches stroke into the corner pocket. A fair amateur will pot his ball pretty often; a first-rate professional will do it very often. No one, perhaps, can make it a really safe stroke. But observe the accuracy required. The margin of error allowed on each side of the perfect stroke is, on a severe table, not more than an inch at the pocket. This allows an error on each side of about one degree in the point of impact with a radius of one inch (the ball being two inches in diameter). This one inch subtends at the distance from which the stroke is played (nearly 5 feet), an angle of $1^\circ \times \sin 60^\circ, \frac{1}{60}$ = about ·8′. To make the stroke you must first, by eye, place your striking-ball right, then you must, by eye, aim the stroke right, and finally you must make the muscles follow the eye rightly. These three elements of error combined must leave a resultant error of not more than four-fifths of a minute; that is to say, a successful stroke must have a total angular error very considerably less than the smallest angular distance which the eye can appreciate between two visible points. This, of course, explains also the superiority of a rifle foresight, which surrounds the object by a symmetrical figure over one which depends on making one point visibly cover another. G. W. H.

Human Hibernation

As it is obvious that Mr. A. H. Hulk is unacquainted with the facts of what he designates a "well-known Indian trick," and as the matter is one of considerable physiological interest, I think it well to place before your readers the nature of the evidence which satisfied me of the genuineness of this condition, when I referred to it in the fourth edition of my "Human Physiology," published thirty-two years ago—a reference retained by the present editor of that treatise. This evidence had been obtained by Mr. Braid from Indian sources, and published by him in a collected form in 1850, the greater part of it having previously appeared in the pages of the *Lancet*. The most important feature of it was the testimony of British medical officers who witnessed the exhumation—most explicitly given in at least three distinct cases—*to the corpse-like condition of the buried man*, a condition which could not be simulated.

I have since learned from a variety of trustworthy sources, that similar testimony has been over and over again given in India by competent witnesses. Moreover, in one of the cases adduced by Mr. Braid, on information supplied to him direct by the British resident in the summer-house of whose garden the man was buried, the circumstances of the inhumation and of the exhumation were such as absolutely to exclude the "tunnel" hypothesis; while in the case narrated by Lieut. A. Boileau in his "Narrative of a Journey in Rajwarra," 1835, the man was buried in a grave lined with masonry and covered with large slabs of stone.

It is further worthy of mention that this performance is not carried on for the sake of gain, but as a religious observance. Many years ago Prof. Max Müller, finding that I was interested in the matter, kindly placed in my hands a pamphlet printed in India, containing a summary of what is termed the Yoga or Yogi philosophy. The devotees of this system have from time immemorial been in the habit of artificially inducing states of more or less complete abstraction, corresponding closely with those of Braidism; and the condition of apparent death, in which the soul is supposed to leave the body for a time, for communion with the higher world, is the culmination of these conditions, only to be reached by the few; to whom, in consequence, a character for the highest sanctity attaches itself.

With the well-authenticated fact of Col. Townsend's self-induction of a state of apparent death, and of his spontaneous recovery from it, as a "leading case," I cannot regard it as incredible that such a condition of "dormant vitality" might be prolonged for days, weeks, or even months, *in a warm atmosphere*. The suspension of the heat-producing power would of course leave the body susceptible of a fatal reduction of temperature, if its warmth were abstracted by a surrounding medium much cooler than itself WILLIAM B. CARPENTER

Athenæum Club, February 20

Methods of Determining the Density of the Earth

I HAVE just seen in the report of the proceedings of the Physical Society (NATURE, January 15, p. 260) the account of the ingenious and very important experiments proposed by Drs. König and Richarz to determine the density of the earth. I would suggest that mercury be substituted for lead as the attracting masses. The homogeneity of density, the precision with which its density and temperature can be determined and the case with which transport from one side of the balance to the other can be effected will commend the use of mercury. The mode of experimenting suggested is the plan of Cornu—used in his determination of the density of the earth by the (Cavendish) Michell experiment—adapted to the same determination by means of the balance.

Let A, B, C be the balance, D E the attracted balls, and F G, H I, the attracting masses of mercury contained in iron spheres of the same capacity, size, and weight. A large mass of mercury is contained in the vessel M, so placed that it has no effect on the balance or on D or E. The balance being in equilibrium with the mass D and E, mercury is allowed to fill F and I, and the effect noted in oscillations after F and I are filled. Then the mercury is drawn from F into H, and G is filled from the reservoir M, and I is emptied, and the second observation obtained. Then D and E are interchanged, and a third observation obtained. Then the mercury in G is run into I, F is filled, and H emptied, and the third observation made, the combination of these four observations making one determination. Electrical effects of

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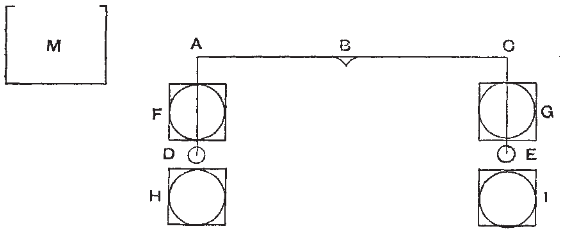
the friction of the mercury are avoided by connecting the vessels by wires with the earth.

If H and I form a mass of lead, I infer that three interchanges of D and E will be required, so that each weight shall be brought opposite the top and bottom of each mass to eliminate want of homogeneity in the lead. In the plan I propose only one interchange will be needed.

The effect, if any, of the vessels full of mercury being at unequal distances from the arms of the balance can be readily determined and allowed for.



The plan I suggest may have already presented itself to the eminent scientists who have originated their notable improvement on Von Jolly's plan. The pleasure I had in reading the account of their proposed research has prompted me to make these suggestions.
Alfred M. Mayer

Stevens Institute of Technology, Hoboken, New Jersey,
February 7

Bees and Flowers

As there is a prevailing idea that bees prefer red and blue to other colours, the following observations on their habits may be of interest:—The common hive bees were very busy among the flowers in the garden this morning. Those most frequented were yellow crocus, snowdrop, and Christmas rose. Next in order, winter aconite, yellow jessamine, and blue scilla. On sweet blue violets and on a dwarf erica, which is now flowering, I could see none. Hitherto my observations led me to suppose they never visited the blue scilla for honey, as I had never seen them settle down to it in a business-like manner, but simply flit over it and go to something else.
G. W. Bulman

Corbridge-on-Lyne

Free Lectures

I observed in Nature for February 19 (p. 367) a reference to the free lectures at Liverpool, and the inquiry, Why cannot the same thing be done in other large towns? It may interest your readers to learn that a series of free lectures has been given during the past two winters by the professors of this College. Tickets for these lectures are distributed through the agency of a committee composed partly of employers, and the attendance at each lecture numbers between 600 and 700. The audience consists wholly of persons in receipt of weekly wages, the services of the lecturers are given gratuitously, and no charge whatever is made for admission. The small expenses of printing and issuing programmes and tickets are defrayed by the Committee. I inclose the syllabus of this, the second year's course, now drawing to a conclusion.

In addition to these lectures we have from time to time free lectures by gentlemen possessing special knowledge of the contents of the Free Libraries. These, too, are attended by a large number, chiefly of working people, and when the art galleries are completed next year arrangements of a similar kind will doubtless be made in connection with them.
William A. Tilden

The Mason Science College, Birmingham, February 24

A Tracing Paper Screen

I can add to the testimony of Mr. Charles Taylor about the efficiency of a screen of tracing paper. I have used for several years a small screen of tracing cloth mounted on rollers like a map. It is very portable and soon fixed. With a sciopticon lantern (oil lamp) I have shown transparencies in the winter months to an audience of seven hundred men in a Midland Railway mess-room during the breakfast hour—8.15 to 8.50 a.m.—though the windows are by no means in the best position, and the room is lighted by skylights as well as by side windows. It is a pity this screen is not better known and more extensively used for scientific lectures.
H. Arnold Bemrose

Irongate, Derby, February 28

An Author's Gratitude

I wish to express my gratitude to Nature and to the reviewer in Nature of my little pamphlet on Electrical Units for exposing a compound error by which the farad came to be described as a fraction of the electrostatic C.G.S. unit of capacity instead of the electro-magnetic unit. Was there ever a greater blunder? It was as if I had said the value of the tenth part of a farthing is sufficient to pay off a million times the National Debt of Great Britain. On recovering from the shock occasioned by the revelation, I hastened to the printer, and got him to correct the error "ere the sun went down," and now I overflow with gratitude to your reviewer, who has relieved me of the awful incubus of an error of the 10^{20} magnitude.
Richard Wormell

SCIENTIFIC LABORATORIES[1]

I FEEL that the present occasion, upon which you have done me the honour to ask me to preside, is one of very great importance indeed, and I wish some person more competent to preside on such an occasion and give a suitable inaugural address were in my place. I am afraid I must confine myself to something not at all worthy of the greatness of an occasion which is almost the opening of a new university. Not quite so, because the real opening of this college took place several months ago; but still it is an occasion which I feel to be much more than merely the opening of a department—a working department—in the college; an occasion of so great moment that I regret that I shall not be able to give anything that could be properly considered a worthy inaugural address. I shall be obliged to ask your indulgence if I confine myself specially to departments with which I am personally familiar—scientific laboratories. The laboratory of a scientific man is his place of work. The laboratory of the geologist and of the naturalist is the face of this beautiful world. The geologist's laboratory is the mountain, the ravine, and the seashore. The naturalist and the botanist go to foreign lands, to study the wonders of nature, and describe and classify the results of their observations. But they must do more than merely describe, represent, and depict what they have seen. They must bring home the products of their expeditions to their studies, and have recourse to the appliances of the laboratory properly so-called for their thorough and detailed examination. The naturalist in his laboratory with his microscope and appliances for the keenest examination, learns to know more than can be learned by merely looking at external beauties. The geologist brings his specimens to the chemist—is himself a chemist perhaps—brings his crystals to the physical laboratory to be examined as to their physical properties, their hardness, the angles between their faces, their optical qualities. Some people might think this an ignoble way to deal with crystals. But it is not so to the trained eye and deeper thought of the scientific man. The scientific man sees and feels beauty as much as any mere observer—as much as any artist or painter. But he also sees something underlying that beauty; he wishes to learn something of the actions and forces producing those beautiful results. The necessity for study below the surface seems to have been earliest recognised in anatomy, and earliest carried out in human anatomy. I am not going to speak of the work of scientific research generally, but with reference to the special occasion which brings us here this day—the opening of the chemical and physical laboratories of the University College of North Wales. I am going to speak

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[1] Address by Prof. Sir William Thomson, F.R.S., on the occasion of the opening of the Laboratories of University College, Bangor.

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